Evolution of the prompt dipole γ-ray emission with incident energy in fusion reactions

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The prompt dipole γ-ray emission is associated with the charge equilibration process occurring in dissipative heavy-ion collisions between partners with different N/Z ratios [1÷7]. Therefore, it takes place in charge asymmetric collisions [8÷14] in addition to the statistical γ-ray emission, originating in the thermal excitation of the dipole vibration in hot compound nuclei. It was predicted for fusion reactions [4, 6] that the prompt dipole γ-ray emission depends on the incident energy, taking a maximum value in an appropriate energy region, situated between the low incident energies near the Coulomb barrier and the higher ones near the Fermi energy domain, where the dipole emission diminishes. As this kind of dipole emission is a cooling mechanism of the composite system in fusion reactions, becoming comparable with the statistical emission under certain conditions, the study of its dependence on incident energy could be of great aid in the formation of superheavy elements. This argument becomes more interesting, when associated with the availability of exotic beams, which allow to reach very large entrance channel charge asymmetries, maximizing thus the prompt dipole γ-ray emission. In the present talk, we will present our results [12÷14] on the evolution of this kind of emission with incident energy in fusion reactions. Calculations based on a collective bremsstrahlung analysis of the reaction dynamics [6] will be discussed and compared with the experimental findings.

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